Civil Aerospace Medical Institute, GA Weather Research

Federal Aviation Administration

Presented to: NTSB

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Overview

- **Quick overview of our main flight simulators**
- **Study 1:** Predicting GA Flight Into Adverse Wx
- **Study 2:** Effect of Video Wx Training Products, Web-Based Wx Briefing on GA Pilot Wx Knowledge & Flight Behavior
- **Study 3:** The Effect of NexRad Image Resolution on Pilot Decision-making (Dennis Beringer & Jerry Ball)
- **Study 4:** Effects of Training School Type and Examiner Type on General Aviation Flight Safety (ongoing)

Equipment

- **AGARS flight simulator**
- **Piper Malibu configuration**

Equipment

- Very Light Jet flight simulator
- Cessna Mustang configuration

Predicting GA Flight Into Adverse Wx

- **What predicts VFR takeoff into IMC?**

NS **60 GA pilots**

NS – Median age: 23.5

NS – Median flight years: 2.3

NS – Median flight hours: 183

– 50% IR / 50% non-IR

- NS **We examined ≅ 80 pilot factors**

NS – Demographics Age, flight hours, etc.

NS – Anxiety level

NS – Risk propensity

NS – Sensation-seeking

NS – General personality

Predicting GA Flight Into Adverse Wx

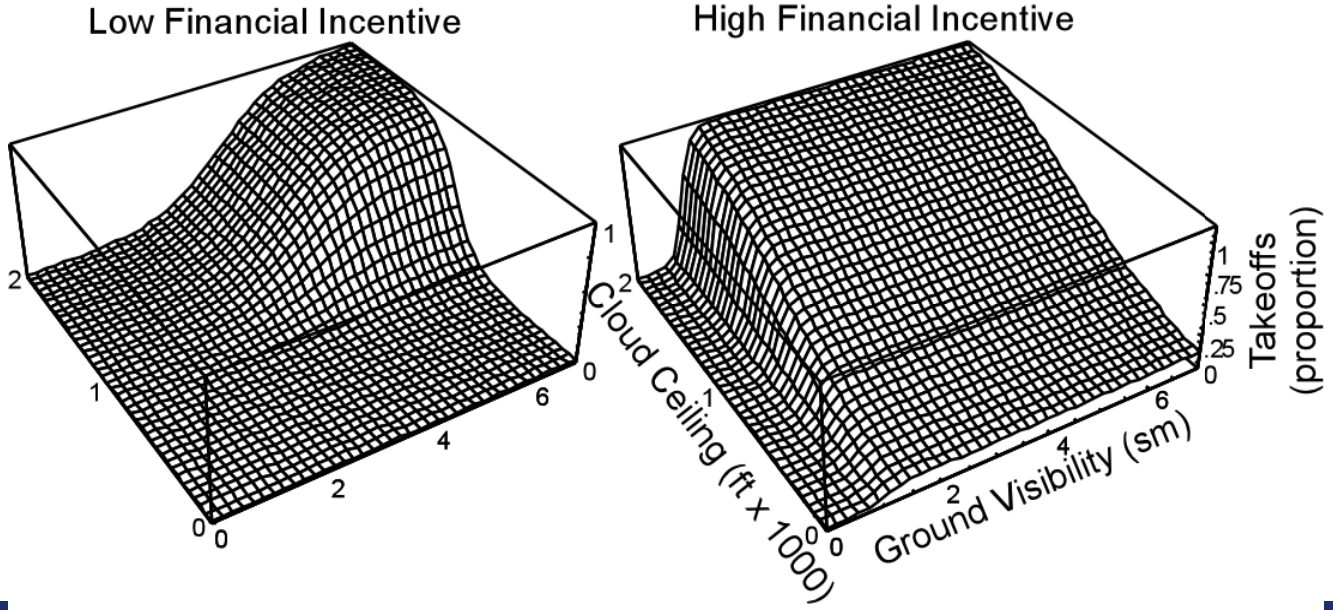
- **What predicts VFR takeoff into IMC?**

Trend – Ground visibility: 1,3,5 nm

Trend – Cloud ceiling: 1000', 2000'

- Visibility x Ceiling $p = .008, R^2 = .521$

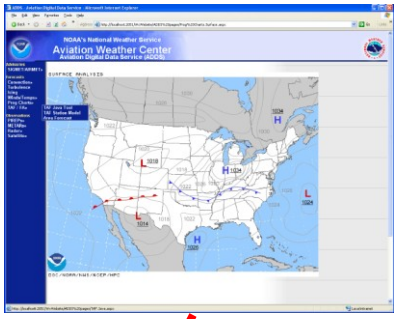
Trend – Financial Incentive: $17/h v.$17/h+$200 takeoff bonus

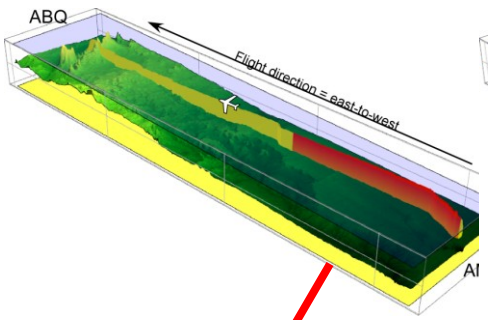


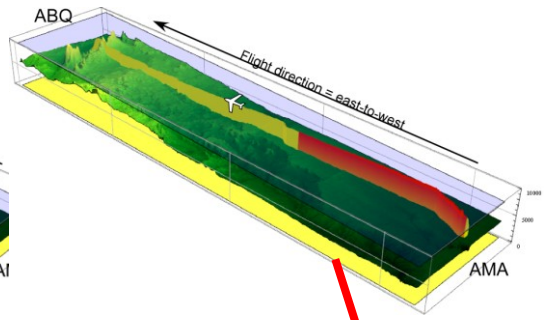
Effect of Video Wx Training Products, Web-Based Wx Briefing on GA Pilot Wx Knowledge and Flight Behavior

- **50 GA pilots saw 1 of 3 wx-related video training products...**
- **...then prepped & flew Amarillo-Albuquerque**
- **We tested for**
  - Wx knowledge
  - Flight behavior ←esp. **Takeoff** or **Refusal**

We tested effects of a host of factors



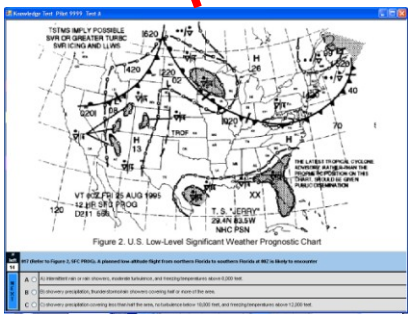


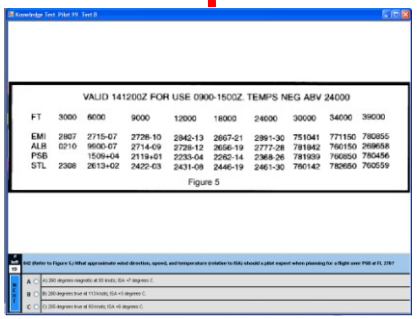


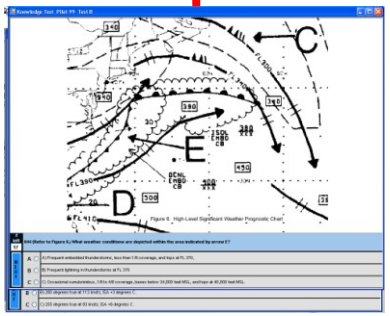
Time Line

1	2	3	4	5		6	7	8
Wx knowledge pre-test	Administer TP1, TP2, Control	Pre-flight briefing 1	Wx knowledge post-test	Flight 1 over rising terrain		Wx knowledge final test	Pre-flight briefing 2	Flight 2 over rising terrain

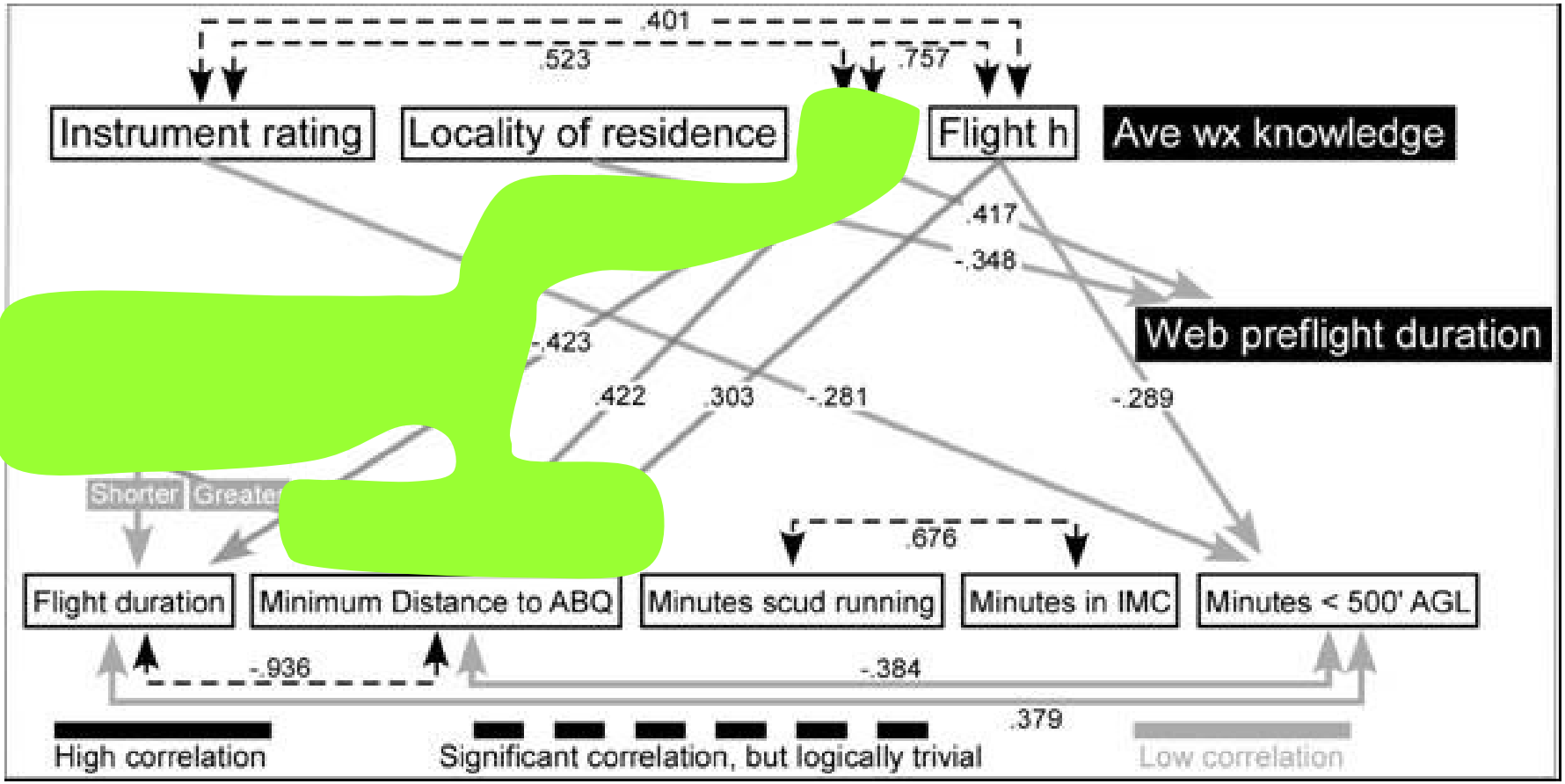
Phase 1 — 3-4 months — Phase 2







Results of Logistic Regression



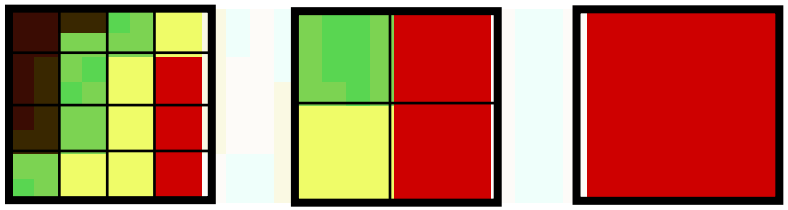
- **Trg Prod 1or2 + Takeoff Hesitancy + Pilot Age ⇒ Flight completion**

Effect of NexRad Image Resolution on Pilot Decision-making (Beringer & Ball)

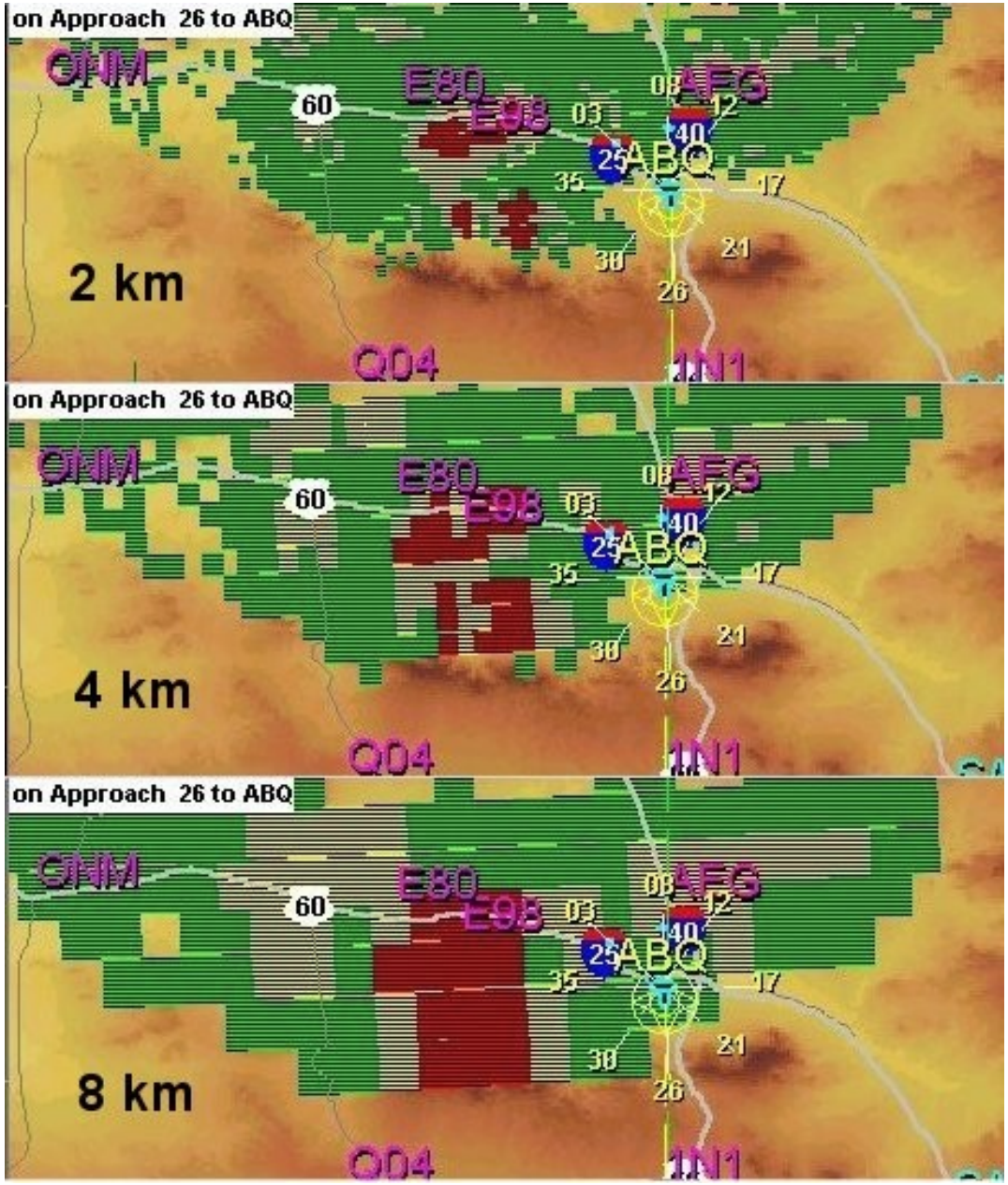
- **Question: Appropriate uses of NexRad data**
  - What can/should be provided in the cockpit?
  - How will pilots use these data?
    - Preferred: Use Strategically (to avoid general areas of weather)
    - Problematic: Use Tactically (to navigate close to or between cells)…
      - Displayed data is 6 to 12 minutes old (-)
      - Base reflectivity is only one index of activity (-)
      - Resolution-reducing algorithms fill areas (+)

Method

- **The "conservative algorithm" ↓**



- **Effect of resolution variation on NexRad image →**
- **32 GA pilots tested**
  - Ages 19-70 yr (median=27)
  - Tot flt hr 40-20K (median=460)
  - Assigned to 1 of 4 groups
    - 2,4,8 km NexRad resolutions
    - baseline (no NexRad)
- **Santa Rosa, NM to ABQ**



Results

- Many pilots used the display tactically
- Higher resolutions deferred decision making
- Many disregarded NexRad in favor of out-the-window view
- Subsequent research (Ball, DOT/FAA/AM-08/3) suggests that brief training can shift “tactical” use to safer “strategic” use.

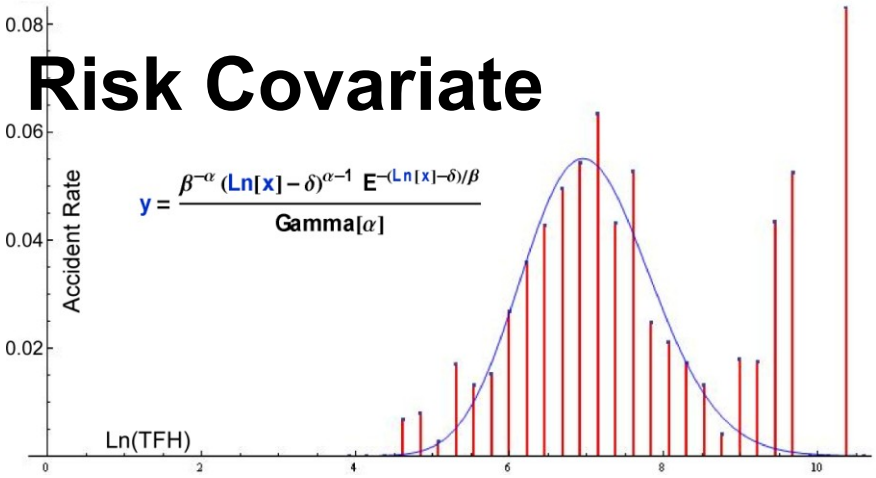
Effects of Training School Type and Examiner Type on GA Flight Safety

- **Part of FAA response to NTSB Safety Study** NTSB/SS-05-01 *Risk factors associated with weather-related general aviation accidents*.
- **Basic Question: "Does**
  - type of flight school (Part 61 v. 141)
  - type of examiner (ASI v. DPE)

  affect pilots' subsequent accident record?"
- **Technical report is currently under review**

Trg School Type & Examiner Type

- **Log-linear analysis**
- **Aggregated Advanced Risk Covariate**
- **Results TBA**



Non-accident Data	Instrument-rated ASI	Instrument-rated BYSCHOOL	Instrument-rated DPE	Non-instrument-rated ASI	Non-instrument-rated BYSCHOOL	Non-instrument-rated DPE
Part 61	161	0	20313	285	0	33114
Part 141	126	2275	3821	121	1296	2439

School

Accident Data						
Part 61	10	0	703	6	0	974
Part 141	5	59	55	1	19	36

School

Non-accident Data	Instrument-rated ASI	Instrument-rated BYSCHOOL	Instrument-rated DPE	Non-instrument-rated ASI	Non-instrument-rated BYSCHOOL	Non-instrument-rated DPE
Part 61	4.445	0	569.7	8.191	0	811.9
Part 141	3.381	59.59	92.45	2.569	30.15	54.39

School

Accident Data						
Part 61	.2447	0	22.05	.1307	0	17.01
Part 141	.1378	1.787	1.815	.0004	.2115	.4592

School